Q. What costs for the local loop does the FCC Order address?

A. The FCC Order concludes that the states may permit LECs to charge CLECs for access to shared local loops no more than the amount of loop costs allocated by the LEC to its interstate rates for retail ADSL-based service.

Q. Does Verizon MA propose to allocate any loop costs to the rates that it will charge for line sharing?

A. No.

Q. What costs for Operational Support Systems ("OSS") does the FCC Order address?

A. The FCC Order concludes that the incumbent LECs should recover in their line sharing charges reasonable incremental costs of OSS modifications that are caused by the obligation to provide line sharing.

Q. What costs associated with cross-connects does the FCC Order address?

A. The FCC Order finds that where the splitter is located "within the incumbent LEC's MDF," the cost for installing cross-connects for xDSL services would, in general, be the same as the costs incurred for cross-connecting loops to the CLEC's collocation facilities.

Q. What costs associated with the splitter does the FCC Order address?

A. The FCC Order concludes that if the incumbent LEC purchases for CLEC use the same splitter that it uses itself for its own xDSL service, states may require that the incumbent assess the CLEC the same "amount that it itself pays for a delivered splitter." It further concludes that the CLEC can purchase its own splitter and transfer it to the incumbent LEC. In addition, the state may allow the LEC to charge to recover the cost of installing the splitters.

Q. What costs associated with conditioning does the FCC Order address?

A. The FCC Order concludes that the states may require that the conditioning charges for shared lines not exceed the charges the LECs are permitted to recover for similar conditioning of stand-alone loops for xDSL-based services.

ii) SPLITTER COSTS

Q. What costs has Verizon MA identified for line sharing associated with the splitter?

A. The Company's cost studies assume the placement of the splitter on a relay rack located in the Company's own space in the central office or installed in a CLEC collocation arrangement. There are four cost components for a splitter mounted in Verizon MA space: (1) installation costs if Verizon MA installs the splitter on behalf of the CLEC; (2) the recurring network maintenance, marketing, and support costs for the splitters; (3) collocation-related costs for the splitter equipment support element; and (4) the nonrecurring cross-connect costs. Collocation related splitter costs are described in Ms. Clark's testimony. Mr. Meacham's study determines the nonrecurring central office wiring costs.

Q. What different provisioning scenarios did Verizon MA assume in developing splitter costs?

A. The Company assumed two different scenarios for the splitter installation costs to capture the different manners in which the splitter could be located, installed, maintained, and supported. These options are: (1) Option C, where the CLEC purchases the splitter and Verizon MA installs it in its own space and maintains and supports it; and (2) Option A, where the CLEC purchases and installs the splitter in its collocation cage. These are the options contained in Verizon MA's interconnection tariff, D.T.E. – Mass. – No. 17, which the Department examined in D.T.E. 98-57, Phase III.

Q. Please describe Option C (CLEC purchased, Verizon MA installed, maintained and supported) and how the costs were developed.

A. In this scenario, the CLEC purchases the splitter and transfers the asset to Verizon MA for a nominal amount. Verizon MA installs the splitter and takes responsibility for the network maintenance, administration and support of the splitter once installed.

The cost study calculates the installation cost for the splitter common equipment shelf and the full complement of 24 cards containing four splitter circuits (*i.e.*, 96-line capacity) by multiplying the material cost by the EF&I factor. This installation cost will be recovered up-front in a non-recurring rate element.

In addition to the installation costs, the Company developed a recurring cost element to recover the operating expenses for network maintenance, administration and other support. Verizon MA identified the total installed investment for the splitter as if it actually purchased and installed the splitter, and then it applied the appropriate ACFs to develop the annual network maintenance, administration, and support recurring cost. These costs appropriately do not include any capital-related costs.

Q. Please describe Option A (CLEC purchased, CLEC installed in collocation cage.

A. In this scenario, the CLEC purchases and installs the splitter in its collocation cage. Verizon MA is responsible only for the network administration and other support of the line sharing equipment and its integration into the Company's network. Therefore, Verizon MA excluded maintenance, repair, and testing costs from the recurring cost and recovers only the cost incurred for administration and other support. Also, in compliance with the Department's directives in D.T.E. 98-57, Phase III (page 122), the ACFs have been applied only to the splitter material investment and not to the installation expense.

iii) TESTING

Q. Is Verizon MA implementing a testing capability for shared lines?

A. Yes. Verizon MA is implementing a Wideband Test System that will allow the Company to minimize its forward-looking costs for trouble shooting on shared loops. Without this enhanced capability, Verizon MA (and CLECs) will incur increased costs and dispatches as the volume of this type of service arrangement increases.

Q. Please explain the Wideband Test System Charge.

A. In accordance with the Department's earlier directives,[29] Wideband Testing is provided on an optional basis for the testing of xDSL capable loops. The wideband testing charge recovers the cost Verizon MA incurs when working with the CLECs to test a data service using the new Hekimian testing system. The Hekimian system provides remote testing and spectrum testing capabilities. The Hekimian wideband testing equipment provides the following information: POTS supervision, central office Noise, Loop Noise, Dial Tone, Loop Wiring, ADSL Signal, and ATU-R Detection. This information will be provided to CLECs upon request.

iv) LINE SHARING OSS COSTS

Q. What OSS costs are associated with Line Sharing?

A. The OSS costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for line sharing (and its associated installation and testing).

Q. How does Verizon MA propose to recover these costs?

A. Verizon proposes a per-line recurring rate that will be charged to each

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[29] D.T.E. 98-57-Phase III, Order Dated September 29, 2000 at 79.

Line Sharing line ordered by a CLEC. Some of the Telcordia-provided software also supports subloop unbundling applications, as described below. The subloop-related software expenses have been removed prior to developing the per-line OSS rate for Line Sharing.

5. DS3-And-Above High Capacity Loops

Q. Please describe the DS-3 and Above high capacity loops.

A. DS-3 and Above high capacity loops (also referred to as "Entrance Facilities") are digital local access services that connect a customer's premises to a Verizon MA central office at the DS3, STS-1, OC3, and OC12 signaling rates. This section of the testimony will address the STS-1, DS3, OC3, and OC12 high capacity loops only.

Q. Please describe the network architecture assumed in each of the Company's High Capacity loop cost studies.

A. The High Capacity loop cost study is premised on the use of Synchronous Optical Network ("SONET") transport equipment. The equipment configuration is the most efficient technology currently available for provisioning high capacity local access service.

Q. To what extent do the facilities used for high capacity loops duplicate those used for the two-wire or four-wire loops?

A. Because of the unique nature of this service and the type of customer it serves, the loop transport facilities involved must be dedicated point-to-point facilities, provided on a completely overlay basis to the more general local access infrastructure. There is no opportunity for network resource sharing other than the fact that the fiber strands supporting this service and supporting the local access services addressed in the loop construct are contained in the same large fiber feeder cable from the central office to the customer location, typically a large high-rise commercial building or a major business campus.

The more prevalent local access services (voice grade loops and DS1 loops) to a large customer location of this kind are most efficiently served by the DLC and fiber optic architecture described previously. The RT delivering the individual voice grade or DS1 loops is located in common space and serves either the entire location or many floors with multiple end-user customers. The construct used for this local loop architecture by Verizon MA is not capable of delivering high-capacity channel services.

Furthermore, high-capacity channel services are delivered directly on fiber to the individual customer premises within a larger location (building or campus). The most efficient fiber architecture for such a service is to provide a direct fiber extension from the feeder cable serving the location up to the customer premises where the high-capacity channel service terminates. This is because the cabling requirements of this service make it economically and technically inefficient to deliver the service optically to the common RT location, terminate the optical system in common equipment, and extend electronically from there to the actual interface to the customer application (usually, a high speed, private data network). Fiber cable packaging and splicing technology mandate that the minimum size of this cable be 12 fiber strands. A customer-dedicated OC-3 or OC-12 SONET transport system is used on this dedicated fiber cable to deliver the actual high capacity channel service.

Q. What investments were included in the High Capacity Loop cost studies?

A. The investments include:

- *Central office electronic equipment,* such as a FLM150 multiplexer ("Mux"), digital cross connect frames, and fiber termination frames;
- *Equipment installed at the customer's premises,* such as a protective cabinet housing the FLM150 Mux, power equipment, cross connect panels, and fiber termination frames; and

- *Fiber cable and associated "structure" investment.* The study assumed 100 percent fiber cable between the central office and the customer's premises.

Q. How were the relevant investments determined?

A. Material prices for electronic equipment and cables reflect the latest negotiated contract prices provided to Verizon MA by the manufacturers. Circuit equipment investment loading factors were multiplied by the material prices to arrive at a total investment. Fiber cable installation and engineering costs were obtained from ECRIS as described in the two-wire and four-wire loop section of this testimony.

Q. How was the structure investment determined?

A. Structure investment was determined using the same methodology as previously describe in the two-wire and four-wire loop section of this testimony.

Q. What recurring cost components were identified for the DS3, STS-1, OC3, and OC12 High Capacity Loops?

A. Two recurring cost components were identified: a non-mileage-sensitive component attributable to terminating electronics at the central office and at the customer's premises, and a mileage-sensitive component attributable to fiber-optic cable and the associated structure.

Q. Is Verizon MA's cost study for High Capacity loops geographically deaveraged?

A. The DS1 loop, which is equivalent to the four-wire digital loop, has been geographically deaveraged as described earlier. Since the typical customer of the higher capacity loops is generally a large business customer, with the vast majority being located in the business sections of a major city type environment, DS3, STS-1, OC3, and OC12 have not been geographically deaveraged. However, the High Capacity loop costs have been calculated on a fixed and per-quarter-mile basis to address the difference in costs by customer loop length.

6. House and Riser

a) In General

Q. What is House and Riser?

A. House and Riser refers to cabling within a multi-story building that provides access to the network side of end-users' network interfaces from a point of interconnection within the building (*e.g.*, in the basement).

Q. Is House and Riser a network element?

A. Yes. House and Riser cable is essentially loop distribution cable. Thus, House and Riser is a component of the unbundled loop, or a "subloop."

Q. What House and Riser costs has the Company developed for this filing?

A. The Company has developed the following costs:

- One-time costs associated with Building Set-up.
- Recurring costs associated with both Vertical and Horizontal House and Riser investments;

Q. Please describe Verizon MA's House and Riser service.

A. House and Riser consists of a metallic pair of house and riser cable in a multistory building. House and Riser investment includes the riser cable itself, the terminations, and the labor associated with the termination of the pair at a location close to the entrance cable (usually the basement) and at a location on (or close to) the customer's floor.

Q. Describe the House and Riser construct used in the Company's cost study.

A. The construct used for House and Riser is described in the diagram provided with the cost study workpapers. It reflects the forward-looking design established by the Company's engineering staff. It is a design that would be implemented in any new, high-rise building. The design is efficient because it uses a 300 pair riser cable, which reduces the installed cost per pair. This size cable also facilitates terminations in groups of 50 pairs to meet the requirements of the different floors in a building requiring house and riser access.

b) Building Set-up Costs

Q. Please describe the Building Set-up cost study.

A. The Building Set-up cost study was developed as a nonrecurring cost and reflects the investments in a backboard and a fifty-pair terminal block.

Q. How did Verizon MA determine the material and installation prices for House and Riser Building Setup?

A. The current vendor material prices and their installation prices, which reflect the latest vendor discounts realized by the Company, were the basis of the input prices to the cost study. Material prices for the metallic cable, terminals, and installation and engineering costs were obtained from ECRIS.

Q. Were the House and Riser Cable Service Building Setup and 50 Pair Terminal charges deaveraged?

A. Yes. All House and Riser elements were deaveraged by density zone. Although the forward-looking design for this element construct is not unique by density zone, installation costs do vary by density zone.

c) *Vertical House and Riser Recurring Costs*

Q. Please describe how the investments for vertical House and Riser were developed.

A. The vertical House and Riser investments were developed on a fixed and variable basis. The fixed investment, which was developed on a per pair basis, includes six 50-pair terminals located close to the entrance cable, 30 feet of 300-pair metallic horizontal intra-building cable, and a 50-pair terminal with 20 feet of 50-pair stub cable located on (or close to) the customer's floor. The variable investments, which were developed on a per-pair, per-floor basis, include ten feet of 300-pair metallic intra-building cable. All investments include installation and engineering.

Q. How did Verizon MA determine the material and installation prices for vertical House and Riser.

A. Material, installation, and engineering costs were identified in the same manner as the House and Riser Building Set-up element, from ECRIS..

Q. How did Verizon MA calculate the per-unit investment of the House and Riser element?

A. Per-unit investments were calculated by dividing the total investments by a utilization factor of 40 percent. This corresponds to the utilization factor used in the loop study for distribution cable.

Q. How were the House and Riser investments converted to monthly costs?

A. The investments associated with the House and Riser element were converted to a monthly cost through the application of the ACFs associated with the Intra-building account (Account No. 2426).

d) Horizontal House and Riser Recurring Costs

Q. Please describe how the costs for horizontal House and Riser were developed.

A. House and Riser Horizontal investment, which was developed on a per pair basis, includes one hundred fifty (150) feet of three-hundred pair metallic horizontal intra-building cable, and a fifty pair terminal with twenty (20) feet of fifty pair stub cable located on (or close to) the customer's floor. Investments were converted to monthly costs in the same manner as Vertical House and Riser.

7. The Distribution Subloop

Q. What is Verizon MA's Unbundled Subloop Arrangement ("USLA")?

A. The USLA provides access to Verizon MA's metallic distribution pairs/facilities at the FDI. USLA provides a two- or four-wire transmission channel between a CLEC-provided Outside Plant Interconnection Cabinet ("COPIC") and the NID or Rate Demarcation Point at the end user location. Both recurring and nonrecurring charges apply to USLA. The nonrecurring charges are discussed in the testimony of Mr. Meacham.

Q. What are the recurring charges associated with USLA?

A. USLA recurring charges will recover the distribution facilities costs associated with two- and four-wire subloops as well as the OSS implementation costs. The distribution facilities costs are based on the costs of the two and four-wire loop discussed earlier. The OSS implementation costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for subloop unbundling (and its associated installation and testing).

8. Unbundled Feeder Subloop

Q. Please describe Verizon MA's Feeder Subloop Element.

A. A feeder subloop provides a dedicated DS1 or DS3 two-point transmission path over a feeder facility in Verizon MA's network between a Verizon MA central office and a Collocation at the Remote Terminal ("CRTEE") arrangement. As with unbundled distribution subloops, both nonrecurring and recurring charges will apply to this arrangement.

Q. What are the recurring charges?

A. Unbundled feeder subloop recurring charges will recover the feeder facilities costs associated with the subloops as well as the OSS implementation costs. The OSS implementation costs include the amortization of one-time expenses in connection with the required Telcordia-provided OSS software for subloop unbundling (and its associated installation and testing).

9. Dark Fiber

Q. What is Dark Fiber?

A. Dark Fiber consists of a continuous fiber optic strand within an existing in-place fiber optic sheath, that is owned by Verizon MA but is not connected to electronic equipment needed to power the line in order to transmit information. (Since information is transmitted on fiber optic cable in the form of light pulses, a fiber without the necessary electronics is appropriately described as "dark.") A CLEC that requests access to Dark Fiber is responsible for the establishment of any fiber optic transmission equipment or intermediate repeaters needed to utilize the fiber to transmit information.

Q. Please describe what is meant by "continuous" fiber optic strand?

A. The term continuous fiber optic strand refers to a fiber optic strand that does not require any additional splicing and construction work in order to build and rearrange the fibers to provide continuity between the CLEC's A and Z locations for the dark fiber circuit.

Q. Please describe the Dark Fiber Cost Study.

A. The Dark Fiber Cost Study determines the cost for offering spare, unlit, continuous fiber optic cable without any attending electronics or photonics. Verizon MA has developed costs for Interoffice ("IOF") and Loop Dark Fiber. In addition, costs have also been developed for Channel Termination Dark Fiber which can be ordered from a CLEC POP to the Verizon MA End Office that serves the specific POP.

For Loop Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed serving wire center cost, and a monthly customer premise cost (if appropriate). For IOF Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile and a monthly fixed cost per serving wire center. For Channel Termination Dark Fiber, the cost elements consist of a monthly variable fiber cost per tenth of a mile, a monthly fixed POP FDF cost, and a monthly fixed cost per serving wire center. Nonrecurring costs are also developed for each of the Dark Fiber elements and are addressed in Mr. Meacham's study.

Q. How were the Loop Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments, utilization, and installation factors were extracted from the Interoffice Transport TELRIC study. For the monthly fixed customer premise cost, the Company used vendor prices for a mix of FDF and associated equipment typically placed at customer premises for its own use. For the monthly variable fiber costs per tenth of a mile, the installed fiber and associated support structure investments were extracted from the Loop TELRIC Study. In each case, the appropriate loadings and ACFs were applied to develop the monthly cost.

Q. How were the IOF Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments, utilization, and installation factors were extracted from the Interoffice

Transport TELRIC study. For the monthly variable fiber costs per tenth of a mile, the installed fiber and associated support structure investments were extracted from the Interoffice Transport TELRIC Study. The appropriate loadings and ACFs were then applied to produce the monthly costs.

Q. How were the Channel Termination Dark Fiber costs developed?

A. For the monthly fixed cost per serving wire center, FDF investments and utilization levels were extracted from the Interoffice transport TELRIC study. Monthly costs were developed through the application of loadings and ACFs.

10. NIDS

Q. What is the NID network element.

A. FCC Rule 319(b) describes and incumbent LECs NID unbundling obligations as follows:

> (b) Network Interface Device. An incumbent LEC shall provide nondiscriminatory access, in accordance with § 51.311 and section 251(c)(3) of the Act, to the network interface device on an unbundled basis to any requesting telecommunications carrier for the provision of a telecommunications service. The network interface device network element is defined as any means of interconnection of end-user customer premises wiring to the incumbent LEC's distribution plant, such as a cross connect device used for that purpose. An incumbent LEC shall permit a requesting telecommunications carrier to connect its own loop facilities to on-premises wiring through

the incumbent LEC's network interface device, or at any other technically feasible point.

As noted previously, the NID has two aspects: it may be a component of the loop, and it is a network element subject to unbundling in its own right. Loop costs were addressed in the preceding section of this testimony (and included NID investment). Here we consider the costs associated with unbundled access to the NID. Such access would be required where a CLEC wishes to connect its own loop to a Verizon MA NID. Also included in this filing are charges associated with the Shared NID. The Shared NID charge recovers the cost incurred when a CLEC shares one or more line terminations in a NID where Verizon MA has existing service and spare capacity.

Two categories of costs are involved: the recurring cost of the investment in the NID itself, and a non-recurring NID connection charge. The NRC is addressed in Mr. Meacham's NRC study.

Q. Please describe the cost methodology used in developing the recurring costs of two-wire and four-wire NIDs, DS1 NIDs, and Shared NIDS.

A. The cost methodology used in developing the recurring NID costs is consistent with the methodology used to develop the NID component of the loop cost. For a Shared NID, the cost reflects the material and labor associated with 1/6 of a fully equipped (6 line) NID.

VIII. LOCAL SWITCHING

A. ELEMENT DESCRIPTION

Q. What is the definition of the local circuit switching network element?

A. FCC Rule 319(c)(1)(A) defines local circuit switching capability as:

(i) Line-side facilities, which include, but are not limited to, the connection between a loop termination at a main distribution frame and a switch line card;

(ii) Trunk-side facilities, which include, but are not limited to, the connection between trunk termination at a trunk-side cross-connect panel and a switch trunk card; and

(iii) All features, functions and capabilities of the switch, which include, but are not limited to:

(1) The basic switching function of connecting lines to lines, lines to trunks, trunks to lines, and trunks to trunks, as well as the same basic capabilities made available to the incumbent LEC's customers, such as a telephone number, white page listing and dial tone, and

(2) All other features that the switch is capable of providing, including but not limited to, customer calling, customer local area signaling service features, and Centrex, as well as any technically feasible customized routing functions provided by the switch.

Rule 319(c) also creates an exception to the unbundling requirement for local switching, applicable "when the requesting telecommunications carrier serves end-users with four or more voice grade (DS0) equivalents or lines, provided that the incumbent LEC provides nondiscriminatory access to combinations of unbundled loops and transport (also known as the 'Enhanced Extended Link') throughout Density Zone 1, and the incumbent LEC's local circuit switches are located in (i) The top 50 Metropolitan Statistical Areas . . ., and (ii) In Density Zone 1 . . .." ("Density Zone 1" was defined by the FCC for carrier access purposes and is unrelated to the loop rate zones discussed elsewhere in this testimony.) This exception may apply to certain of Verizon MA's switches.

Q. What local switching rate elements is Verizon MA proposing?

A. The Local Switching element addressed in the Company's cost study consists of the following components:

- Line ports (analog, digital, and coin);

- Trunk ports (digital);
- Local Switch Usage (terminating and originating); and
- Reciprocal Compensation Usage (terminating).

Q. Does the Local Switching element contain any switch features?

A. Yes. Features that can be provisioned through the switch processor and that do not require any specific, unique hardware are included in the Local Switching element. A list of the features that were included in the proposed usage rate can be found in the Local Switching cost study, Part C.

Q. Can a carrier purchase a feature that requires specific, unique hardware, and that is therefore not included in the Local Switching Usage element?

A. Yes. The most commonly used features that have specific, unique hardware requirements can be purchased from Verizon MA as "port additives." A list of those features can be found in the Local Switching cost study, Part C.

B. TECHNOLOGY ASSUMPTIONS

Q. Please describe the forward-looking end office switch construct.

A. The forward-looking end office switch construct is based on digital switching with an access line split of 57.13:42.87 mix of 5ESS and DMS-100 technologies, respectively. The lines are assumed to be provisioned on DLC and cooper, with 25 percent on integrated DLC GR-303 peripherals, at a 3:1 line concentration at the RT consistent with the loop forward-looking construct; and 75 percent on analog line ports (copper cable pairs and universal DLC). All trunking is designed as clear channel capability trunking on the vendor's latest available trunk peripherals.

Q. What is the reason for the mix of the two switch vendor technologies?

A. The use of two suppliers ensures a degree of strategic diversity in the sources of supply of an important network asset. Moreover, the mix of 5ESS and DMS-100 technologies represents Verizon MA's forward-looking construct for local switching technologies to serve Massachusetts. This mix is consistent with Verizon MA's deployment of each switching technology.

Q. What locations are assumed for switches in Verizon MA's study?

A. Consistent with the FCC's TELRIC regulations, the study assumes current wire center (and, therefore, switch host/remote) locations.